Memorandum

To: David Schonbrunn, TRANSDEF
From: Norm Marshall
Subject: HSR Ridership & Revenue Model Coefficients and Constants
Date: February 3, 2010

I have reviewed the "final coefficients and constants in the HSR Ridership & Revenue Model" attached to the memorandum from George Mazur of Cambridge Systematics to Nick Brand dated January 29, 2010. This memo states that these coefficients and constants are different than the model coefficients and constants published in the Task 5a report, and furthermore that: "The client, MTC, elected not to update the Task 5a report nor to include the final coefficients and constants in the final project report."

The transmittal of these materials from the California High Speed Rail Authority states: "... this material as presented did not previously exist and significant amounts of sub-consultant staff time went into preparing it." Therefore, the mathematical underpinnings of the HSR ridership and revenue forecasts have never been disclosed to the public or to regulatory authorities, and the presumption that the previously documented coefficients and constants had been used to develop the forecasts was false.

I have reviewed the final coefficients and constants in the main mode choice model, and determined that they are completely different than those presented in the Task 5a. Furthermore, I conclude that the final coefficients and constants introduce unacceptable biases into the model, and that the model as presented in the January 29, 2010 memo is invalid for forecasting future HSR ridership and revenue. I summarize two of the problems I have identified in the attached page.

Two of the problems identified in the final coefficients and constants in the HSR Ridership & Revenue Model

1. The service frequency coefficients have increased in magnitude to implausible and invalid values. For long business trips, the coefficient has changed from -0.003 in the previously published model to -0.179, a factor of 60. More importantly yet, the coefficient is completely out of scale with the in-vehicle time (IVT) coefficient. Both the service frequency and IVT variables are in terms of minutes. The Task 5a report table included the ratio between the service frequency and IVT coefficients. For the long business trips, the ratio was 0.21. This means that 1 minute of additional headway between train departures has the same disutility as 0.21 minutes of travel time on the train, or 1 hour of additional headway is equivalent to 18.6 minutes on the train. In contrast, the ratio (not shown) between the service frequency and IVT coefficients in the final model is 9.94. This implies that an additional hour of headway between trains is equivalent to 9.94 hours of onboard travel time, which is clearly ridiculous. This makes headways much more important in the model than they really are. The Altamont alignment has longer headways than the Pacheco alignment, so this biases the comparative results.

2. Many new mode-specific constants have been added in the final model, and the values of the constants have been changed drastically. The final constants are of such great magnitude that they dominate the model. For example, the final air constants are a combination of a general constant, an airport-to-airport constant, and (in some cases) an income constant. The airport-to-airport constants vary enormously from interchanges with good air service levels to those with poor air service levels. This should not be necessary. It indicates that the service variables are not working properly in the model. The HSR constants have dropped by a large amount from the model published in the Task 5a report. For example, for the long business trips, the constant has decreased from -.3503 to -6.757 (or -5.610 for high income). In the T-statistic column, this constant is labeled as "constrained" suggesting it has been fitted to a particular ridership number the same way the airport interchange constants appear to be fitted to air data. The question then is: fitted to what? There is no HSR service and no HSR ridership to fit to. Inexplicably, the HSR constants are significantly more negative than the conventional rail constants, which for long business trips is -4.620 (or -4.007 for high income). This implies that if both HSR and conventional rail had the same time, cost, and frequency, that the conventional rail would be preferred by a wide margin. This is nonsense.